PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-274103

(43)Date of publication of application : 05.10.2001

---

(51)Int.Cl.

H01L 21/205
C04B 37/00
H01L 21/285
H01L 21/3065
// C04B 35/10
C04B 35/584
C04B 35/581
C04B 35/58

---

(21)Application number : 2000-160722

(22)Date of filing : 30.05.2000

(71)Applicant : SUMITOMO ELECTRIC IND LTD

(72)Inventor : HIIRAGIDAIRA HIROSHI
NAKADA HIROHIKO

---

(30)Priority

Priority number : 2000011862 Priority date : 20.01.2000 Priority country : JP

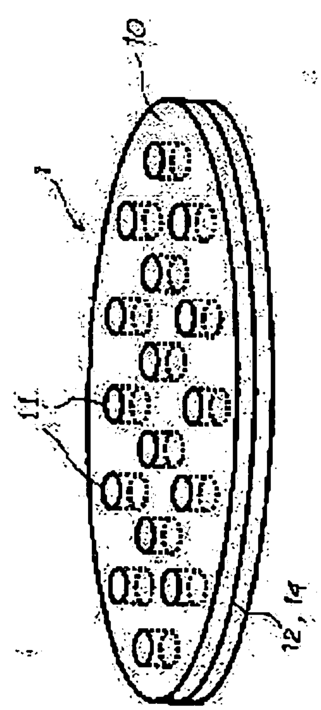
---

(54) GAS SHOWER MEMBER FOR SEMICONDUCTOR MANUFACTURING APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a gas shower member, capable of making reaction uniform inside a semiconductor manufacturing apparatus and having a function of preheating the reaction gas, while the gas passes through the body so as to suppress the generation of blockage of through-holes as well as generation of particles.

SOLUTION: This gas shower member 1 has a sintered aluminum-nitride base material member 10, having a thickness of 5 mm or smaller and having a plurality of through-holes 11, and has a conductive layer formed on the sintered aluminum-nitride base material member 10 as a heater circuit pattern 12 or an upper plasma electrode 14.



LEGAL STATUS

[Date of request for examination]	15.04.2002
[Date of sending the examiner's decision of rejection]	13.07.2004
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3654142
[Date of registration]	11.03.2005
[Number of appeal against examiner's decision of rejection]	2004-16469
[Date of requesting appeal against examiner's decision of rejection]	06.08.2004
[Date of extinction of right]	

CLAIMS

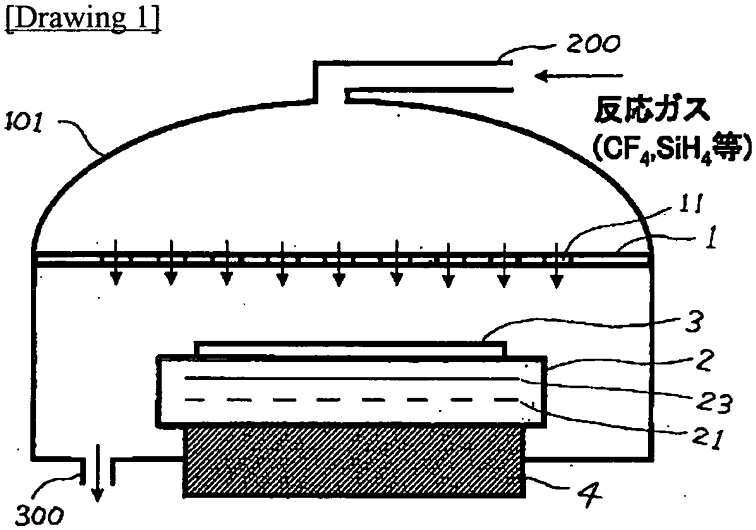
[Claim(s)]
[Claim 1] The gas shower object for semiconductor fabrication machines and equipment equipped with the ceramic sintered compact base material which the thickness of a base material is a gas shower object for semiconductor fabrication machines and equipment 5mm or less, and has two or more through tubes, and the conductive layer formed in said ceramic sintered compact base material.
[Claim 2] Said conductive layer is a gas shower object for semiconductor fabrication machines and equipment containing the conductive layer which forms a heating circuit pattern according to claim 1.
[Claim 3] Said conductive layer is a gas shower object for semiconductor fabrication machines and equipment containing the conductive layer which forms the electrode for plasma generating according to claim 1 or 2.
[Claim 4] Said ceramic sintered compact base material is a gas shower object for semiconductor fabrication machines and equipment given in either from claim 1 to claim 3 which has said through tube with a diameter of 0.01mm or more two or more [0.1 //cm].
[Claim 5] Said ceramic sintered compact base material is a gas shower object for semiconductor fabrication machines and equipment according to claim 4 which has said through tube with a diameter of 0.01mm or more two or more [0.5 //cm].
[Claim 6] Said ceramics is a gas shower object for semiconductor fabrication machines and equipment given in either containing one sort chosen from the group which consists of alumimium nitride, an aluminum oxide, silicon nitride, and acid alumimium nitride from claim 1 to claim 5.
[Claim 7] Said ceramics is a gas shower object for semiconductor fabrication machines and equipment according to claim 6 which is alumimium nitride.
[Claim 8] Said ceramic sintered compact base material contains the 1st ceramic sintered compact and the 2nd ceramic sintered compact. Said conductive layer is formed on the front face of said 1st ceramic sintered compact. Further It intervenes between the front face of said 1st ceramic sintered compact in which said conductive layer was formed, and said 2nd ceramic sintered compact. The gas shower object for semiconductor fabrication machines and equipment given in either containing the glue line which joins said 1st ceramic sintered compact and said 2nd ceramic sintered compact from claim 1 to claim 7.
[Claim 9] Said glue line is a gas shower object for semiconductor fabrication machines and equipment containing glass according to claim 8.
[Claim 10] Said glue line is a gas shower object for semiconductor fabrication machines and equipment according to claim 9 which is the glass layer which has a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C8.0x10-6/degree C.
[Claim 11] Said glue line is a gas shower object for semiconductor fabrication machines and equipment containing non-oxide ceramics according to claim 8.
[Claim 12] Said glue line is a gas shower object for semiconductor fabrication machines and equipment containing the non-oxide ceramics which have a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C6.0x10-6/degree C according to claim 11.
[Claim 13] Said non-oxide ceramics are gas shower objects for semiconductor fabrication machines and

equipment according to claim 11 or 12 which contain either alumimium nitride or silicon nitride more than 50 mass %.
[Claim 14] Said glue line is a gas shower object for semiconductor fabrication machines and equipment containing the compound which produces the oxide containing an ytterbium, neodium, and calcium, or the oxide which contains an ytterbium, neodium, and calcium with heating according to claim 8.
[Claim 15] Said glue line is a gas shower object for semiconductor fabrication machines and equipment containing the compound which produces the oxide containing an yttrium and aluminum, or the oxide which contains an yttrium and aluminum with heating according to claim 8.
[Claim 16] Said conductive layer is a gas shower object for semiconductor fabrication machines and equipment given in either from claim 1 to claim 7 in which it is formed in one front face of said ceramic sintered compact base material, or both front faces, and the protective layer is formed so that the front face of said conductive layer may be covered.
[Claim 17] Said protective layer is a gas shower object for semiconductor fabrication machines and equipment containing glass according to claim 16.
[Claim 18] Said protective layer is a gas shower object for semiconductor fabrication machines and equipment according to claim 17 which is the glass layer which has a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C8.0x10-6/degree C.
[Claim 19] Said protective layer is a gas shower object for semiconductor fabrication machines and equipment containing non-oxide ceramics according to claim 16.
[Claim 20] Said protective layer is a gas shower object for semiconductor fabrication machines and equipment containing the non-oxide ceramics which have a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C6.0x10-6/degree C according to claim 19.
[Claim 21] Said non-oxide ceramics are gas shower objects for semiconductor fabrication machines and equipment according to claim 19 or 20 which contain either alumimium nitride or silicon nitride more than 50 mass %.
[Claim 22] Said conductive layer is a gas shower object for semiconductor fabrication machines and equipment given in either containing at least one sort chosen from the group which consists of a tungsten, molybdenum, silver, palladium, platinum, nickel, and chromium from claim 1 to claim 21.
[Claim 23] Said conductive layer is a gas shower object for semiconductor fabrication machines and equipment given in either from claim 1 to claim 22 which is formed along the flat surface in said ceramic sintered compact base material, is further formed along the same flat surface as the flat surface in said ceramic sintered compact base material so that it may connect with said conductive layer, and is equipped with the external connection terminal exposed from said ceramic sintered compact.
[Claim 24] The gas shower object for semiconductor fabrication machines and equipment given in either from claim 1 to claim 23 which is further equipped with the temperature detecting element built in said ceramic sintered compact base material.

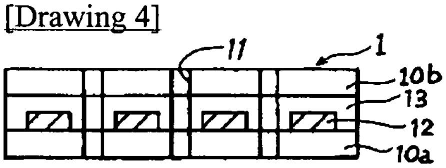
[Translation done.]

DRAWINGS

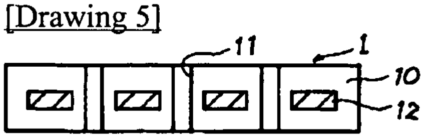
[Drawing 1]



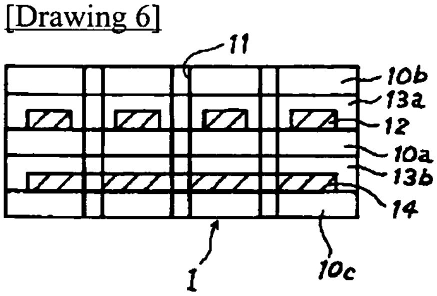
[Drawing 4]



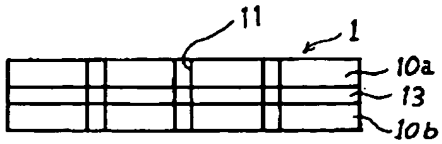
[Drawing 5]



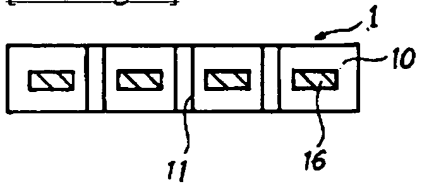
[Drawing 6]



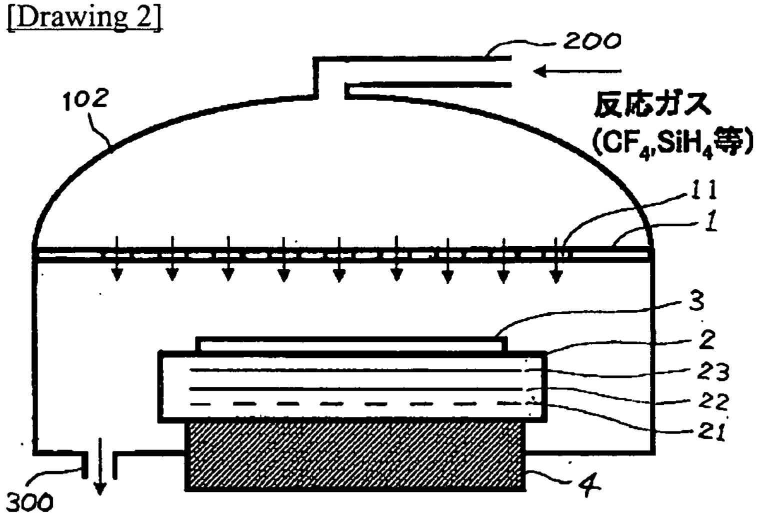
[Drawing 11]



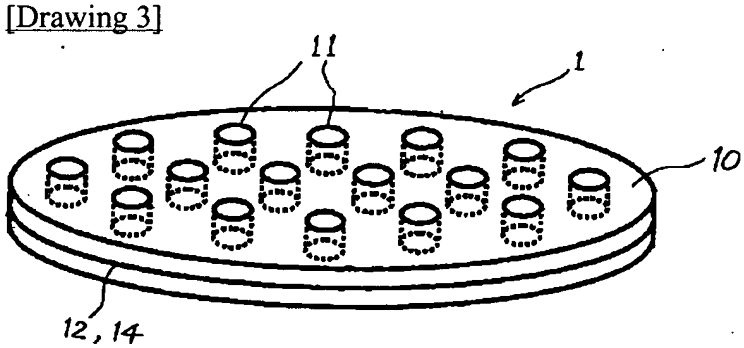
[Drawing 12]



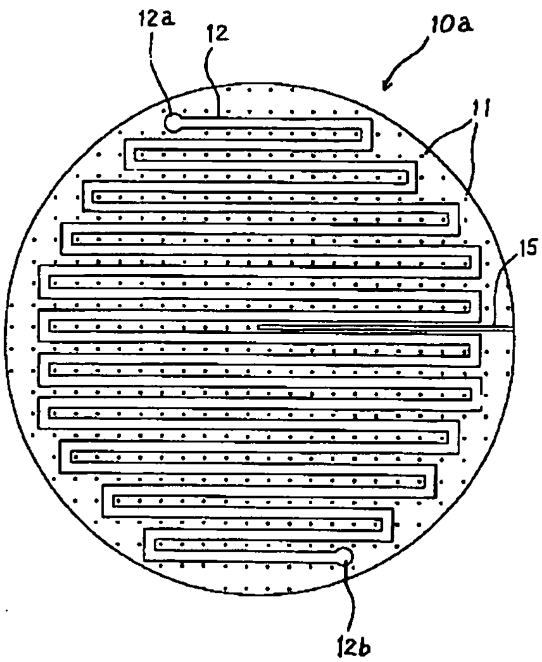
[Drawing 2]



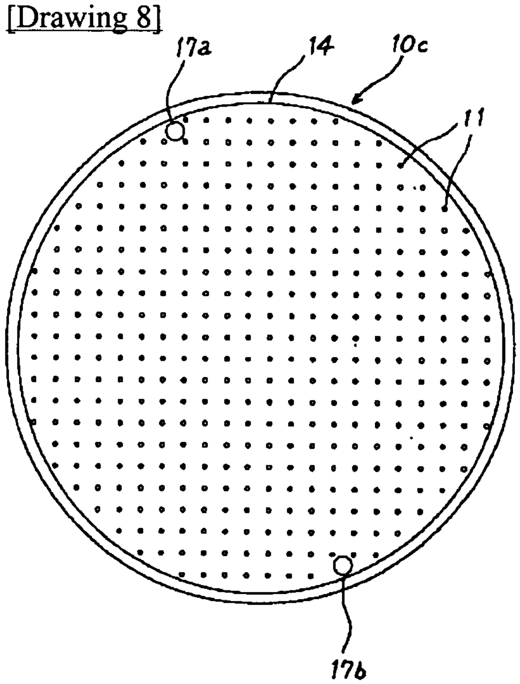
[Drawing 3]



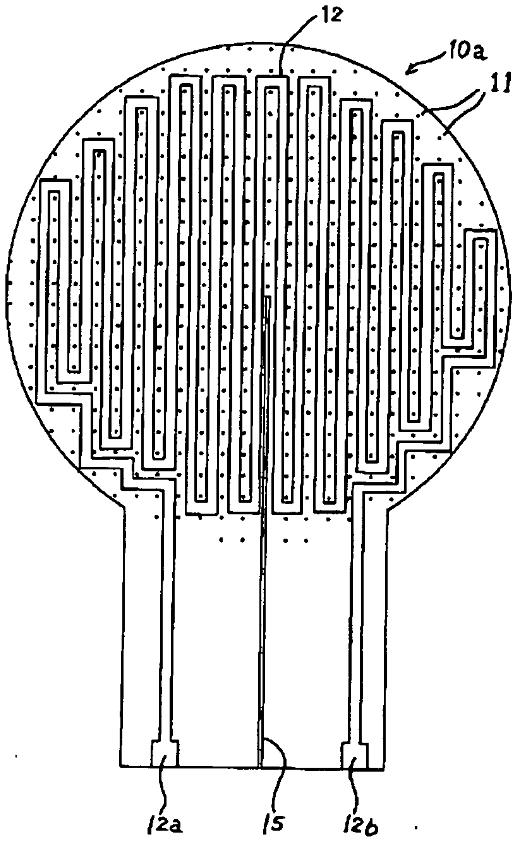
[Drawing 7]



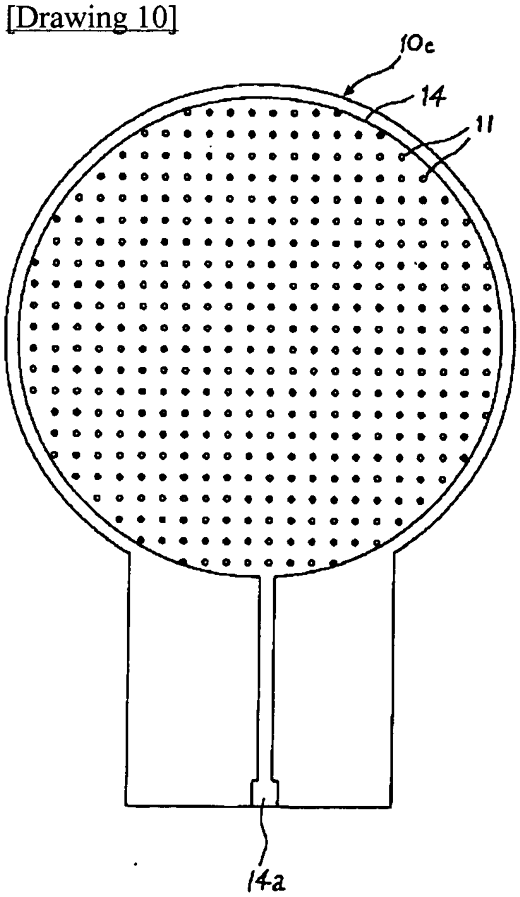
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In case the front face of a semi-conductor wafer is etched or the film is formed on the front face, many semi-conductor wafers were held on the rack, and the technique of heating the gas for etching or film formation at a heater from a periphery a sink and if needed by the batch type (hot wall type) has been used.
[0003] However, it has been a problem that originate in the temperature by the location in semiconductor fabrication machines and equipment or the ununiformity of the flow of gas, and etching and the membranous quality formed vary as the demand of high integration of a semiconductor device and improvement in the speed becomes severe in recent years. Then, two or more etching systems and film formation equipment are put in order, and the type of semiconductor fabrication machines and equipment is switching between those equipments to single wafer processing which processes one semi-conductor wafer at a time with power feed using a loader.
[0004] In the semiconductor fabrication machines and equipment of single wafer processing, a semi-conductor wafer is fixed on a supporter by carrying out a chuck according to electrostatic force etc. by carrying a semi-conductor wafer on the front face of the supporter made from the metallurgy group made from the ceramics, and putting it, fixing mechanically, or adding an electrical potential difference to the electrode built in the supporter. In order that the held semi-conductor wafer may adjust film formation rates and etch rates, such as CVD (ChemicalVapor Deposition), plasma CVD, etching, and plasma etching, the temperature of the front face is controlled strictly. For the temperature control, a heater is built in a wafer supporter, the outermost surface of a wafer supporter is heated, and a semi-conductor wafer is heated with heat transfer. In order to reduce the manufacturing cost of a semiconductor device, to enlarge the diameter of a semi-conductor wafer and to increase the number of the semiconductor chip with which per semi-conductor wafer is manufactured is tried. When the diameter of a semi-conductor wafer is enlarged, in order to suppress dispersion in the reaction environment of etching in semiconductor fabrication machines and equipment, or film formation, the soak nature required of the outermost surface of a wafer supporter becomes still severer.
[0005] Moreover, from the pipe attached in the chamber of semiconductor fabrication machines and equipment, between the part where gas is blown directly, and the part blown into an indirect target, the flow of gas becomes an ununiformity and the concentration of reactant gas will differ only in sending in reactant gas in the front face of a semi-conductor wafer. Therefore, it becomes difficult to control film formation and etching to homogeneity in the front face of a semi-conductor wafer. Then, in order to make the entrainment of gas into homogeneity on the front face of a semi-conductor wafer and to make concentration of reactant gas regularity, the method of installing the gas shower object which formed many through tubes in the tabular base material is adopted as the location of the right above of a semi-conductor wafer. According to this approach, gas blows off in the shape of a shower, and the most uniform possible gas concentration is obtained on the front face of a semi-conductor wafer.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the gas shower object for supplying reactant gas to a semi-conductor wafer at homogeneity in semiconductor fabrication machines and equipment, such as a CVD system, plasma-CVD equipment, an etching system, and a plasma etching system, about the gas shower object for semiconductor fabrication machines and equipment.
[0002]
[Description of the Prior Art] In case the front face of a semi-conductor wafer is etched or the film is formed on the front face, many semi-conductor wafers were held on the rack, and the technique of heating the gas for etching or film formation at a heater from a periphery a sink and if needed by the batch type (hot wall type) has been used.
[0003] However, it has been a problem that originate in the temperature by the location in semiconductor fabrication machines and equipment or the ununiformity of the flow of gas, and etching and the membranous quality formed vary as the demand of high integration of a semiconductor device and improvement in the speed becomes severe in recent years. Then, two or more etching systems and film formation equipment are put in order, and the type of semiconductor fabrication machines and equipment is switching between those equipments to single wafer processing which processes one semi-conductor wafer at a time with power feed using a loader.
[0004] In the semiconductor fabrication machines and equipment of single wafer processing, a semi-conductor wafer is fixed on a supporter by carrying out a chuck according to electrostatic force etc. by carrying a semi-conductor wafer on the front face of the supporter made from the metallurgy group made from the ceramics, and putting it, fixing mechanically, or adding an electrical potential difference to the electrode built in the supporter. In order that the held semi-conductor wafer may adjust film formation rates and etch rates, such as CVD (ChemicalVapor Deposition), plasma CVD, etching, and plasma etching, the temperature of the front face is controlled strictly. For the temperature control, a heater is built in a wafer supporter, the outermost surface of a wafer supporter is heated, and a semi-conductor wafer is heated with heat transfer. In order to reduce the manufacturing cost of a semiconductor device, to enlarge the diameter of a semi-conductor wafer and to increase the number of the semiconductor chip with which per semi-conductor wafer is manufactured is tried. When the diameter of a semi-conductor wafer is enlarged, in order to suppress dispersion in the reaction environment of etching in semiconductor fabrication machines and equipment, or film formation, the soak nature required of the outermost surface of a wafer supporter becomes still severer.
[0005] Moreover, from the pipe attached in the chamber of semiconductor fabrication machines and equipment, between the part where gas is blown directly, and the part blown into an indirect target, the flow of gas becomes an ununiformity and the concentration of reactant gas will differ only in sending in reactant gas in the front face of a semi-conductor wafer. Therefore, it becomes difficult to control film formation and etching to homogeneity in the front face of a semi-conductor wafer. Then, in order to make the entrainment of gas into homogeneity on the front face of a semi-conductor wafer and to make

concentration of reactant gas regularity, the method of installing the gas shower object which formed many through tubes in the tabular base material is adopted as the location of the right above of a semi-conductor wafer. According to this approach, gas blows off in the shape of a shower, and the most uniform possible gas concentration is obtained on the front face of a semi-conductor wafer.

[0006]

[Problem(s) to be Solved by the Invention] Although the temperature to which gas is made to react changes with classes of reactant gas, it is about 400-800 degrees C in 200-500 degrees C and CVD by elevated-temperature etching at 100-400 degrees C and plasma CVD.

[0007] Usually, a heater is built in a wafer supporter and it is made predetermined temperature required in order to react by heating a wafer directly. If reactant gas is supplied to the reaction section from a gas shower object with a room temperature, since reactant gas will be rapidly heated on a wafer and wafer temperature will also be lowered in connection with it, it is difficult especially to make temperature of the gas within the wafer side of a large area into homogeneity, and a reaction rate also changes with locations and it becomes difficult to form the film of uniform thickness.

[0008] Then, after sending reactant gas into a chamber from piping besides semiconductor fabrication machines and equipment and heating at a heater, how to carry out preheating of the reactant gas can be considered by adopting the structure which a gas shower object is made to pass.

[0009] However, when preheating of the reactant gas is carried out before passing a gas shower object, before passing the through tube of a gas shower object, reactant gas starts a reaction, the through tube of a gas shower object is made to blockade, or there is a problem of generating a resultant vainly in the preheating section. Moreover, the problem of adhering on the front face of a semi-conductor wafer as a foreign matter also has the particle which a resultant exfoliates and is produced.

[0010] In order to solve the above-mentioned problem, it is possible to build a heater in a gas shower object. However, since the volume outer diameter of a heater coil is about 3-6mm when the gas shower object which contained the heater by putting a heater coil and heater wires between ceramic Plastic solids, and performing hotpress sintering is manufactured, when a heater coil is embedded to the interior of the base material of a gas shower object, thickness is set to 10mm or more, and it becomes easy to blockade a through tube. Moreover, it is necessary to form a through tube so that a heater coil may not be contacted. Therefore, there is a problem that the location which forms a through tube will be restrained by the laying-under-the-ground location of a heater coil. In this case, many fields where spacing of a through tube becomes 3-6mm or more will exist. Moreover, if the thickness of a gas shower object becomes thick in order to lay a heater coil underground, also when a through tube becomes long, the above-mentioned lock out will become easy to take place.

[0011] So, in order to secure the soak nature on the wafer with which a reaction occurs, passing gas is also performed, after it warms a gas shower object by the radiant heat from the wafer supporter of the heater internal organs under a wafer and a gas shower object gets warm at it to predetermined temperature.

[0012] In a membranous laminating, if the thickness which carried out [thickness] the laminating not only to the wafer of a product but to a gas shower object, a wafer supporter, and a chamber, and carried out the laminating to them becomes thick, exfoliation will be produced in thermal stress, and it becomes particle, adheres on the wafer of a product, and a defect is generated. Therefore, the front face of the components inside these chambers needs to clean frequently. The optimal temperature for a laminating differs from the optimal temperature for cleaning. Since the etching force is too strong when the gas of ClF_3 or NF_3 grade is generally used for cleaning and it uses at laminating temperature, temperature is lowered and it is necessary to make it not hurt one's front face of a gas shower object, a wafer supporter, and a chamber from laminating temperature beyond the need. Then, it is necessary to change temperature with laminating (elevated temperature) -> cleaning (low temperature) -> laminating (elevated temperature) --. Since the gas shower object which does not contain a heater was heated only with the radiant heat of a lower heater, most time amount was taken to reach predetermined temperature, and making a cleaning process intervene had become the factor which reduces the throughput of wafer processing.

[0013] Then, the purpose of this invention is offering the gas shower object for semiconductor fabrication machines and equipment which can make a reaction homogeneity into the chamber of semiconductor fabrication machines and equipment, such as a CVD system, plasma-CVD equipment, and an etching system, while canceling an above-mentioned trouble.
[0014] Moreover, another purpose of this invention is offering the gas shower object for semiconductor fabrication machines and equipment which can perform a cleaning process smoothly when the laminating of the unnecessary film which lock out of a through tube cannot take place easily in a thin gas shower object, and becomes lock out and the cause of particle happens on the bill-of-materials side in the chamber for semiconductor fabrication machines and equipment, and can raise the throughput of wafer processing.
[0015]
[Means for Solving the Problem] The thickness of a base material is a gas shower object for semiconductor fabrication machines and equipment 5mm or less, and the gas shower object for semiconductor fabrication machines and equipment according to this invention is equipped with the ceramic sintered compact base material which has two or more through tubes, and the conductive layer formed in that ceramic sintered compact base material.
[0016] In order to reduce cleaning frequency, a gas shower object from which lock out of a through tube does not take place for at least 24 hours or more was desired, but if the gas shower object in which the through tube of the usual diameter (0.01mm or more) was formed is used for a base material with a thickness of 5mm or less, time amount until lock out of a through tube takes place can be carried out in 24 hours or more. Therefore, when the gas shower object according to this invention is used, in a thin gas shower object, lock out of a through tube cannot take place easily, and there is also no need for the preheating of the reactant gas used as the cause which causes lock out of a through tube. Moreover, by building a heater in a gas shower object as a conductive layer, heating to the elevated temperature which performs the laminating of the film from the low temperature which cleans the cascade screen adhering to the chamber components leading to [of particle] generating to a wafer top can be performed smoothly, and the throughput of wafer processing can be raised. Although the sum total of the time amount of a temperature up and a temperature fall was wanted to be less than 1 hour, by building in a heater, a heating up time can be shortened and temperature fall time amount can be shortened by constituting a thin gas shower object.
[0017] Moreover, in the gas shower object of this invention, a conductive layer contains preferably the conductive layer which forms a heating circuit pattern also from a homogeneous viewpoint of a reaction. Since preheating is carried out by doing in this way while reactant gas passes the through tube of a gas shower object, a reaction can be made into homogeneity in the chamber for semiconductor fabrication machines and equipment. Therefore, lock out of a through tube and generating of particle can be controlled.
[0018] Preferably, in the gas shower object of this invention, a conductive layer contains the conductive layer which forms the electrode for plasma generating. Since the space between a plasma up electrode and a gas shower object can be lost by doing in this way, it becomes possible to equalize a reaction in the chamber for semiconductor fabrication machines and equipment by equalization of the plasma. Therefore, the lock out of a through tube and generating of particle by the unnecessary film formation generated in the above-mentioned space can be controlled.
[0019] Preferably, in the gas shower object of this invention, a ceramic sintered compact base material has a through tube with a diameter of 0.01mm or more two or more [0.1 //cm], and has a through tube with a diameter of 0.01mm or more two or more [0.5 //cm] still more preferably. Since reactant gas can be supplied to homogeneity within the chamber of semiconductor fabrication machines and equipment at a semi-conductor wafer by carrying out the magnitude and the consistency of a through tube beyond the above-mentioned value, it becomes possible to make more the temperature distribution on the front face of a semi-conductor wafer into homogeneity.
[0020] As for the ceramics used for the base material which constitutes the gas shower object of this invention, it is desirable that any one sort of alumimium nitride, an aluminum oxide, silicon nitride, or

acid alumimium nitride is included, and it is most desirable to use alumimium nitride from thermal conductivity and a corrosion resistance viewpoint. While the base material of a gas shower object is equipped with thermal resistance by using the above ceramics, it is used for reactant gas, for example, can also have the corrosion resistance over the corrosive gas containing a halogen.
[0021] As for a ceramic sintered compact base material, in the gas shower object of this invention, it is desirable that a conductive layer is formed on the front face of the 1st ceramic sintered compact including the 1st ceramic sintered compact and the 2nd ceramic sintered compact. And as for the gas shower object of this invention, it is desirable that the glue line which intervenes between the front face of the 1st ceramic sintered compact in which the conductive layer was formed, and the 2nd ceramic sintered compact, and joins the 1st ceramic sintered compact and the 2nd ceramic sintered compact is included further.
[0022] Moreover, a conductive layer may be formed in one front face of a ceramic sintered compact base material, or both front faces, and the gas shower object of this invention may be constituted by forming a protective layer so that the front face of a conductive layer may be covered. In order to form a conductive layer in one front face of this ceramic sintered compact as a heating circuit pattern and to protect only one conductive layer from corrosion gas, such as a halogen, as a gestalt of concrete operation, using a ceramic sintered compact as a ceramic sintered compact base material, it is the structure of covering the front face of a conductive layer with a corrosion resistance high protective layer and the protective layer which consists of non-oxide ceramics preferably, and the gas shower object of heating circuit internal organs may be constituted. Moreover, only one ceramic sintered compact is used as a ceramic sintered compact base material. In order to form a conductive layer in one front face of this ceramic sintered compact as a heating circuit pattern, to form a conductive layer as a plasma up electrode on the surface of another side and to protect a conductive layer from corrosion gas, such as a halogen It is the structure of covering the front face of the conductive layer formed in both sides of a ceramic sintered compact with a corrosion resistance high protective layer and the protective layer which consists of non-oxide ceramics preferably, and the gas shower object having a heating circuit and a plasma up electrode may be constituted. In above any case, since it is not necessary to join a ceramic sintered compact, defect factors, such as junction spare time, can be reduced and improvement in the yield can be aimed at. Moreover, since a gas shower object is constituted from a sintered compact of one sheet, reduction of a manufacturing cost can be aimed at.
[0023] As for an above-mentioned glue line or an above-mentioned protective layer, it is desirable that glass is included. As for an above-mentioned glue line or an above-mentioned protective layer, with the gas shower object used by impressing the high voltage at an elevated temperature, it is still more desirable from the viewpoint of thermal resistance, corrosion resistance, and withstand voltage that non-oxide ceramics are included. In this case, as for thermal conductivity or an insulating viewpoint to non-oxide ceramics, it is desirable that either alumimium nitride or silicon nitride is included more than 50 mass %.
[0024] Moreover, when using either alumimium nitride, an aluminum oxide, silicon nitride or acid alumimium nitride as ceramics which constitutes a base material, as for the above-mentioned glue line, it is desirable that it is the glass layer which has a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C8.0x10-6/degree C. By using such a glass layer as the above-mentioned glue line, the coefficient of thermal expansion of a glue line can be made almost equivalent to a ceramic sintered compact, and thermal stress produced in case it is junction or heating of a gas shower object, and cooling can be made small.
[0025] As the above-mentioned protective layer, it is desirable to use corrosion resistance high glass as much as possible. Moreover, as for the viewpoint of thermal stress reduction to a protective layer, it is desirable that it is the glass layer which has a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C8.0x10-6/degree C. To make into less than 30 minutes time amount which carries out the temperature up of the gas shower object from a room temperature to 600 degrees C is made into the target, and this target can be attained when a coefficient of thermal expansion is within the limits of the above.

[0026] When using alumimium nitride as ceramics which constitutes a base material, as for the above-mentioned glue line, it is desirable also in glass that the compound which produces the oxide containing an ytterbium (Yb), neodium (Nd), and calcium (calcium) or the oxide which contains an ytterbium (Yb), neodium (Nd), and calcium (calcium) with heating is included from wettability and an adhesive viewpoint. When the ceramics which constitutes a base material is silicon nitride, as for the above-mentioned glue line, it is desirable also in glass that the compound which produces the oxide containing an yttrium (Y) and aluminum (aluminum) or the oxide which contains an yttrium (Y) and aluminum (aluminum) with heating is included from wettability and an adhesive viewpoint.
[0027] Moreover, when using non-oxide ceramics as an ingredient of a glue line or a protective layer, it is desirable from a viewpoint of thermal stress to use the non-oxide ceramics which have a coefficient of thermal expansion not more than more than 3.0x10-6/degree-C6.0x10-6/degree C.
[0028] As for a conductive layer, in the gas shower object of this invention, it is desirable that at least one sort of a tungsten, molybdenum, silver, palladium, platinum, nickel, or chromium is included.
[0029] As for a conductive layer, in the gas shower object of this invention, it is desirable to be formed along the flat surface in a ceramic sintered compact base material. Furthermore, as for a gas shower object, it is desirable to have the external connection terminal which it was formed along the same flat surface as the flat surface in a ceramic sintered compact base material so that it might connect with a conductive layer, and has been exposed from the ceramic sintered compact. By doing in this way, only the field of the ceramic sintered compact base material which contains the conductive layer is exposed to reactant gas, and can arrange an external connection terminal besides the chamber of semiconductor fabrication machines and equipment. Moreover, while being able to heat a gas shower object to homogeneity by forming the external connection terminal linked to the conductive layer built in the ceramic sintered compact base material, and its conductive layer along the same flat surface, it becomes possible to be also able to lessen time amount which heating and cooling take, namely, to raise a heating rate and a cooling rate.
[0030] As for the gas shower object of this invention, it is desirable to have further the temperature detecting element built in the ceramic sintered compact base material. By doing in this way, the temperature distribution of a gas shower object can be measured and whenever [stoving temperature / of a gas shower object] can be controlled.
[0031]
[Embodiment of the Invention] Drawing 1 and drawing 2 are drawings showing notionally the gestalt of operation of the semiconductor fabrication machines and equipment with which the gas shower object of this invention is applied.
[0032] As shown in drawing 1 , to the chamber 101 of a CVD system or an etching system, the semi-conductor wafer 3 as a processing object with which film formation or etching is made is arranged. The semi-conductor wafer 3 is being fixed on the wafer supporter 2. The wafer supporter 2 is attached in the base material 4. The wafer supporter 2 is equipped with the electrode 23 for electrostatic chucks for fixing the semi-conductor wafer 3 according to electrostatic force, and the heating circuit 21 for heating the semi-conductor wafer 3. The gas shower object 1 is established above the semi-conductor wafer 3. The gas shower object 1 has two or more through tubes 11 for passing reactant gas, and contains the heating circuit pattern for heating reactant gas. The heating circuit pattern is built in the gas shower object 1 with the gestalt of a conductive layer. The reactant gas for film formation or the gas for etching is introduced into the interior of a chamber 101 from a gas inlet 200. The introduced gas passes two or more through tubes 11, and is supplied on the front face of the semi-conductor wafer 3. Predetermined film formation or predetermined etching is performed on the front face of the semi-conductor wafer 3. In order to exhaust the gas inside a chamber 101, the exhaust port 300 is established.
[0033] As shown in drawing 2 , inside the chamber 102 used for plasma-CVD equipment or a plasma etching system, the semi-conductor wafer 3 as a processing object of film formation or etching is arranged. The semi-conductor wafer 3 is fixed on the wafer supporter 2. The wafer supporter 2 is attached on the base material 4. The wafer supporter 2 is equipped with the heating circuit 21 for heating the semi-conductor wafer 3, the plasma lower electrode 22 for generating the plasma in a chamber 102,

and the electrode 23 for electrostatic chucks made to generate the electrostatic force for fixing the semi-conductor wafer 3. The gas shower object 1 is established above the semi-conductor wafer 3. The gas shower object 1 has two or more through tubes 11 for passing reactant gas, and it contains the plasma up electrode and the heating circuit pattern for heating reactant gas so that the plasma lower electrode 22 may be countered. The heating circuit pattern and the plasma up electrode are built in the gas shower object 1 with the gestalt of a conductive layer. The object for film formation introduced into the interior of a chamber 102 from the gas inlet 200 or the gas for etching passes the through tube 11 of the gas shower object 1, and is supplied on the front face of the semi-conductor wafer 3. Plasma discharge occurs between the plasma up electrode built in the gas shower object 1, and the plasma lower electrode 22 built in the wafer supporter 2. Thus, film formation or etching predetermined in the front-face top of the semi-conductor wafer 3 is performed by the formed gas plasma. The exhaust port 300 for discharging the gas inside a chamber 102 is established.
[0034] Drawing 3 is the perspective view showing the gestalt of one operation of the gas shower object of this invention. As shown in drawing 3 , in the gas shower object 1, the conductive layer which forms the heating circuit pattern 12 and the plasma up electrode 14 is built in the ceramic sintered compact base material 10.
[0035] Drawing 4 - drawing 6 are drawings showing cross-section structure notionally as a gestalt of operation of the gas shower object of this invention.
[0036] As shown in drawing 4 , the gas shower object 1 has the structure where the ceramic sintered compact base materials 10a and 10b of two sheets were joined. On one front face of ceramic sintered compact base material 10a, the heating circuit pattern 12 is formed as a conductive layer. The ceramic sintered compact base materials 10a and 10b are joined by making a glass layer or a non-oxide ceramics layer intervene between one front faces of ceramic sintered compact base material 10a and the front faces of ceramic sintered compact base material 10b in which the heating circuit pattern 12 was formed. Two or more through tubes 11 are formed so that ceramic sintered compact base material 10a, a glass layer or the non-oxide ceramics layer 13, and ceramic sintered compact base material 10b may be penetrated. The heating circuit pattern 12 is formed so that a through tube 11 may not be contacted.
[0037] As shown in drawing 5 , the heating circuit pattern 12 may be formed in the interior of the unified ceramic sintered compact base material 10 as a conductive layer by sintering on both sides of a conductor paste between the ceramic Plastic solids of two sheets. In this case, the glass layer or non-oxide ceramics layer as a glue line is not contained in the gas shower object 1.
[0038] Moreover, as shown in drawing 6 , the gas shower object 1 contains the heating circuit pattern 12 and the plasma up electrode 14 with the gestalt of a conductive layer. The heating circuit pattern 12 is formed as a conductive layer on one front face of ceramic sintered compact 10a. The ceramic sintered compacts 10a and 10b are joined by making glass layer or non-oxide ceramics layer 13a intervene between one front face of ceramic sintered compact 10a in which the heating circuit pattern 12 was formed, and ceramic sintered compact 10b. Moreover, the plasma up electrode 14 is formed as a conductive layer on one front face of ceramic sintered compact base material 10c. The ceramic sintered compacts 10a and 10c are joined by making glass layer or non-oxide ceramics layer 13b intervene between one front faces of ceramic sintered compact base material 10c and the front faces of another side of ceramic sintered compact base material 10a in which the plasma up electrode 14 was formed. Thus, the gas shower object 1 equipped with the heater function and the plasma electrode is constituted.
[0039] In addition, you may make it the gas shower object 1 contain only one conductive layer which serves both as a heating circuit pattern and a plasma up electrode. Moreover, a gas shower object may be constituted so that only a plasma up electrode may be built in.
[0040] Drawing 7 is the top view showing one front face of ceramic sintered compact base material 10a in which the heating circuit pattern was formed. As shown in drawing 7 , two or more detailed through tubes 11 are formed in one front face of ceramic sintered compact base material 10a. The heating circuit pattern 12 is formed according to the pattern fixed in the shape of zigzag as a conductive layer so that the location of a through tube 11 may not be contacted. The connection terminals 12a and 12b of the circle configuration for connecting outside are formed in the both ends of the heating circuit pattern 12.

Moreover, on one front face of ceramic sintered compact base material 10a, the slot 15 for inserting a temperature sensor as a temperature detecting element is formed.
[0041] Drawing 8 is the top view showing one front face of a ceramic sintered compact base material in which the plasma up electrode was formed. As shown in drawing 8 , it is formed on one front face of ceramic sintered compact base material 10c so that the through tube and location of ceramic sintered compact base material 10a which two or more detailed through tubes 11 show to drawing 7 may be in agreement. Moreover, two through tubes 17a and 17b are formed so that it may be in agreement with the location of the connection terminals 12a and 12b of the heating circuit pattern shown in drawing 7 . The plasma up electrode 14 is mostly formed as a conductive layer over the whole surface on one front face of ceramic sintered compact base material 10c so that opening of a through tube 11 may not be plugged up.
[0042] Moreover, as shown in drawing 7 , the heating circuit pattern 12 is formed as a conductive layer on one front face of ceramic sintered compact 10a. By covering with non-oxide ceramics layer 13a one front-face top of ceramic sintered compact 10a in which the heating circuit pattern 12 was formed, the protective layer which protects a heating circuit pattern from corrosion gas, such as a halogen, is formed. Thus, using ceramic sintered compact of one sheet 10a, you may constitute so that the gas shower object 1 may contain the heating circuit pattern 12 with the gestalt of a conductive layer.
[0043] Furthermore, as shown in drawing 7 , the heating circuit pattern 12 may be formed as a conductive layer on one front face of ceramic sintered compact 10a, and as shown as a conductive layer on the front face of another side at drawing 8 , the plasma up electrode 14 may be formed. In this case, the protective layer which protects the heating circuit pattern and plasma up electrode as a conductive layer from corrosive gas, such as a halogen, is formed by covering these conductive layer top with a non-oxide ceramics layer. Thus, using ceramic sintered compact of one sheet 10a, you may constitute so that a gas shower object may contain the heating circuit pattern 12 and the plasma up electrode 14 with the gestalt of a conductive layer.
[0044] Drawing 9 is the top view in which the heating circuit pattern was formed, which will be ceramic sintered-compact base-material 10a Accepted and in which showing one flat surface of the gestalt of one operation. As shown in drawing 9 , the connection terminals 12a and 12b are formed along the same flat surface on one front face of ceramic sintered compact base material 10a so that it may connect with the heating circuit pattern 12, they are prolonged to a side face, and can connect now with wiring on the outside of the chamber of semiconductor fabrication machines and equipment. Moreover, the slot 15 for inserting a temperature sensor can also extend to the side face of ceramic sintered compact base material 10a, and can insert a temperature sensor now from the outside of the chamber of semiconductor fabrication machines and equipment. The temperature of a gas shower object is controllable using the temperature-control module installed in the outside of semiconductor fabrication machines and equipment according to the temperature measured with the temperature sensor.
[0045] Drawing 10 is the top view in which the plasma up electrode was formed, which will be ceramic sintered-compact base-material 10c Accepted and in which showing one flat surface of the gestalt of one operation. As shown in drawing 10 , connection terminal 14a is formed along the same flat surface on one front face of ceramic sintered compact base material 10c so that it may connect with the plasma up electrode 14, it is prolonged to a side face, and can connect now with wiring on the outside of the chamber of semiconductor fabrication machines and equipment.
[0046] The ceramic sintered compact which constitutes the base material of the gas shower object of this invention can be manufactured by the conventional approach, adds the assistant for sintering as occasion demands to ceramic powder, adds a binder if needed further, and manufactures it by sintering the Plastic solid of that mixed powder. The alumimium nitride from a viewpoint equipped with the corrosion resistance over the corrosive gas containing thermal resistance and a halogen etc., an aluminum oxide, silicon nitride, and acid alumimium nitride of ceramics are desirable, and alumimium nitride is the most desirable from thermal conductivity and a corrosion resistance viewpoint.
[0047] As an approach of fabricating ceramic powder, the well-known sheet forming approaches, such as a doctor blade, extrusion, and a press, are used. After drying a Plastic solid, it pierces or cuts in the

configuration where contraction at the time of sintering was taken into consideration. After forming a through tube at this time or joining a sintered compact, a through tube may be formed by machining.
[0048] It sinters, after carrying out the debinder of the Plastic solid. Although it is desirable to perform sintering by ordinary pressure, it is not restricted especially. As long as there is need, the front face of a sintered compact may be ground or cutting processing may be performed to a sintered compact. However, when a dimension and curvature have fallen within the predetermined range, you may use for the base material of a gas shower object in the condition [having sintered].
[0049] A conductive layer is formed on the front face of a ceramic sintered compact by carrying out printing spreading and baking the **-strike containing metals, such as refractory metal [, such as a tungsten and molybdenum,], such mixture or silver, and silver-palladium and nickel-chromium, or the conductive matter of an alloy on a ceramic sintered compact. It piles up by making adhesives, such as glass or non-oxide ceramics, intervene between the ceramic sintered compact with which the conductive layer was formed, and other ceramic sintered compacts, and a ceramic sintered compact is joined. Thus, the gas shower object which contained the conductive layer in the ceramic sintered compact base material can be manufactured.
[0050] In the above-mentioned manufacture approach, the approach of forming a conductive layer, i.e., the postmetallizing method, is adopted by applying and baking the **-strike containing the conductive matter on a ceramic sintered compact. In order to make the conductive layer equivalent to a heating circuit pattern or a plasma up electrode build in a ceramic sintered compact base material, after carrying out printing spreading of the paste containing refractory metals or such mixture, such as a tungsten and molybdenum, on the front face of a ceramic Plastic solid, piling up and carrying out thermocompression bonding of other ceramic Plastic solids and performing debinder processing to a Plastic solid, the KOFA year method for performing sintering of a ceramic Plastic solid and printing of a ********-strike to coincidence may be adopted.
[0051] In order to form each conductive layer of a heating circuit pattern and a plasma up electrode, to manufacture the gas shower object which contains a two-layer conductive layer, since the conductive layer which serves as two functions, a heater and a plasma up electrode, is built in a ceramic sintered compact base material, or to make it a compact, one conductive layer which serves as the function of both a heater and a plasma up electrode may be formed.
[0052] In order to supply reactant gas on the front face of a semi-conductor wafer at homogeneity, it is desirable to form preferably the through tube which has the diameter of at least 0.01mm or more by the consistency of two or more [0.5 //cm] with the consistency of two or more [0.1 //cm].
[0053]
[Example] (Example 1) After adding 5 mass % and a binder to alumimium nitride powder and carrying out distributed mixing of the yttria ($Y2O3$) as sintering acid at it, it fabricated using the doctor blade method so that it might become the thickness of 1.0mm after sintering. While piercing so that the outer diameter after sintering might be set to 300mm after drying this Plastic solid, 500 through tubes were pierced and formed so that the diameter after sintering might be set to 0.5mm. This Plastic solid was degreased in the nitrogen gas air current with a temperature of 800 degrees C, and it sintered at the temperature of 1800 degrees C for 4 hours. The vertical side of the obtained sintered compact was ground using the diamond abrasive grain. Thus, the alumimium nitride sintered compact base material of two sheets was produced.
[0054] Printing spreading of what kneaded tungsten powder and a baking assistant with the ethyl cellulose binder on one front face of an alumimium nitride sintered compact base material of one sheet was carried out. the line whose line breadth of a printing pattern is 3.0mm -- a pattern -- carrying out -- this line -- as it indicated to drawing 7 that a pattern does not contact opening of a through tube, it formed in the shape of zigzag. The alumimium nitride sintered compact with which this printing pattern was formed was degreased in nitrogen gas with a temperature of 800 degrees C, and the conductive layer was formed by baking in nitrogen gas with a temperature of 1700 degrees C.
[0055] On the other hand, after carrying out printing spreading of the glass powder on one front face of an alumimium nitride sintered compact base material of one more sheet, it degreased at the temperature

of 500 degrees C. One front face of this alumimium nitride sintered compact base material and the front face of an alumimium nitride sintered compact base material in which the conductive layer was formed were piled up, and where it fixed with the fixture made from molybdenum and a weight is carried, it joined in nitrogen gas with a temperature of 650 degrees C. Thus, the gas shower object which consists of an alumimium nitride sintered compact base material having a heating circuit pattern as shown in drawing 4 was manufactured. The thickness of the acquired gas shower object was 2.0mm.
[0056] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer, it was **0.4 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 100 hours, in the front face or through tube 11 of the gas shower object 1, film formation was not performed and adhesion of the film was not generated, either. Moreover, there was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 10 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 6 minutes from a room temperature to 600 degrees C. The crack etc. was not looked at by the gas shower object at the time of a temperature up and a temperature fall.
[0057] (Example 2) Two alumimium nitride sintered compact base materials were manufactured using the same manufacture approach as an example 1. The gas shower object of the same specification as an example 1 was manufactured except having made the number of a through tube into 100 pieces.
[0058] The acquired gas shower object 1 was built into the CVD system as shown in drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. The temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition. The temperature distribution were **4.0 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 was performed for 100 hours, the film was not formed in the front face or through tube 11 of a base material of the gas shower object 1 at all, and the film did not adhere. Moreover, particle size did not generate particle 0.05 micrometers or more on the front face of a silicon wafer 3, either. After reaction termination, when supply of the power source to the heating circuit pattern 12 was suspended, the temperature of the gas shower object 1 reached the room temperature in 10 minutes from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 6 minutes from a room temperature to 600 degrees C.
[0059] (Example 3) Three alumimium nitride sintered compact base materials with a diameter [of 300mm] and a thickness of 1mm which have same number of through tubes by the same manufacture approach as an example 1 were manufactured.
[0060] Printing spreading of what kneaded tungsten powder and a baking assistant with the binder on one front face of an alumimium nitride sintered compact base material of one sheet was carried out. Line breadth used the printing pattern as the linear pattern 0.5mm and whose line spacing are 0.5mm, and as it indicated to drawing 7 that this linear pattern does not contact opening of a through tube, it formed it in the shape of zigzag.
[0061] Moreover, printing spreading of what kneaded tungsten powder and a baking assistant with the

binder also on one front face of an alumimium nitride sintered compact base material of one more sheet was carried out. The printing pattern was used as the almost circular pattern, and it was formed so that a plasma up electrode might be constituted, as it indicated drawing 8 that opening of a through tube is not plugged up.

[0062] By baking the printing pattern formed on above one front face of the alumimium nitride sintered compact base material of two sheets like an example 1, the conductive layer which forms a heating circuit pattern and a plasma up electrode was formed on the alumimium nitride sintered compact base material, respectively.

[0063] The above-mentioned alumimium nitride sintered compact base material of two sheets and the alumimium nitride sintered compact base material of one more sheet were joined by making a glass layer intervene like an example 1. Thus, the gas shower object 1 which contains the heating circuit pattern 12 and the plasma up electrode 14 as shown in drawing 6 was manufactured. The thickness of the acquired gas shower object was 3.0mm.

[0064] This gas shower object 1 was built into the plasma-CVD equipment for silicon oxide (SiO2 film) formation as shown in drawing 2 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 300 degrees C. Reactant gas was supplied on the front face of a silicon wafer 3 by making a through tube 11 pass reactant gas, where it impressed 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in the condition, it was **0.5 degrees C. Where it impressed 200V also to the plasma up electrode 14 of the gas shower object 1 and the gas plasma is formed in the interior of a chamber 102, when processing which forms silicon oxide on the front face of a silicon wafer 3 was performed for 50 hours, lock out was looked at by the through tube and cleaning was required. Moreover, particle with a particle size of 0.05 micrometers or more was not generated on the front face of a silicon wafer 3. After reaction termination, when the power source supplied to the heating circuit pattern 12 and the plasma up electrode 14 was stopped, the temperature of the gas shower object 1 reached the room temperature in 13 minutes from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 10 minutes from a room temperature to 600 degrees C.

[0065] (Example 4) After adding 1 mass % and a binder for 3 mass % and a calcium oxide (CaO) to alumimium nitride powder and carrying out distributed mixing of the yttria (Y2O3) as a baking assistant at it, doctor blade shaping of the mixed powder was carried out so that the thickness after sintering might be set to 1.0mm. 500 through tubes from which it pierces so that an outer diameter may be set to 300mm after sintering, after drying this Plastic solid, and a diameter is set to 0.5mm after sintering were pierced and formed. Printing spreading of what kneaded tungsten powder and a baking assistant with the ethyl cellulose binder on one front face of this Plastic solid was carried out. the line whose line breadth of a printing pattern is 2.0mm -- a pattern -- carrying out -- this line -- as it indicated to drawing 7 that a pattern does not contact opening of a through tube, it formed in the shape of zigzag. Thus, thermocompression bonding of the alumimium nitride Plastic solid of one more sheet was piled up and carried out on the alumimium nitride Plastic solid in which the printing pattern was formed. A printing pattern and alumimium nitride were sintered to coincidence by degreasing the alumimium nitride Plastic solid of two sheets which carried out thermocompression bonding in a nitrogen gas air current with a temperature of 800 degrees C, and sintering at the temperature of 1800 degrees C for 4 hours. Thus, the gas shower object 1 which consists of an alumimium nitride sintered compact base material 10 which contained the heating circuit pattern 12 as shown in drawing 5 , and was unified was manufactured. The thickness of the acquired gas shower object was 2.0mm.

[0066] It included in the CVD system as shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at

600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution on the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **0.5 degrees C. Moreover, when processing which forms the titanium nitride film (TiN film) on the front face of a silicon wafer 3 was performed for 100 hours, the film was not formed in the front face or through tube of a base material of the gas shower object 1 at all, and the film did not adhere. There was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when the current supply to the heating circuit pattern 12 was stopped, the temperature of the gas shower object 1 reached the room temperature in 10 minutes from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 6 minutes from a room temperature to 600 degrees C.

[0067] (Examples 5-17) In the examples 5-17, by the same approach as an example 1, the through tube was formed and produced the ground alumimium nitride sintered compact.

[0068] Printing spreading of what kneaded tungsten powder and a baking assistant with the ethyl cellulose system binder on one front face of an alumimium nitride sintered compact of one sheet was carried out. The heating circuit pattern was formed as a conductive layer by degreasing this at 900 degrees C among nitrogen gas, and being burned in nitrogen gas with a temperature of 1700 degrees C.

[0069] Printing spreading of what kneaded the mixed powder of the non-oxide ceramics and oxide ceramics which were blended so that it might, on the other hand, have the presentation of the glue line indicated in the following table 2 on one front face of an alumimium nitride sintered compact of one more sheet, or oxide-ceramics powder with the ethyl cellulose system binder was carried out. After degreasing this at 900 degrees C in nitrogen gas, it piled up on one front face of an alumimium nitride sintered compact in which the heating circuit pattern was formed, fixed with the fixture made from carbon, and joined by heating in nitrogen gas with the virtual junction temperature shown in Table 2 where a load is hung.

[0070] Thus, the gas shower object which consists of an alumimium nitride sintered compact base material having a heating circuit pattern as shown in drawing 4 was manufactured. The thickness of the acquired gas shower object was 2.0mm.

[0071] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 750 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer, it was **0.5 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 100 hours, in the front face or through tube 11 of the gas shower object 1, film formation was not performed and adhesion of the film was not generated, either. There was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 10 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 6 minutes from a room temperature to 600 degrees C.

[0072] In the examples 1-4, even if it carried out continuous duty of the gas shower object at the temperature of 700 degrees C among the fluorine ambient atmosphere for 1000 hours, it was satisfactory, but when continuous duty was carried out at the temperature of 750 degrees C for 1000 hours and continuous duty was carried out at one piece and the temperature of 800 degrees C among ten pieces for 1000 hours, degradation of three pieces and a heater was seen among ten pieces. Since the

protective effect of a heater fell according to the heat deterioration of a glass layer, it thinks.
[0073] In the examples 5 and 11, even if it carried out continuous duty of the gas shower object at the temperature of 750 degrees C with the temperature of 700 degrees C among the fluorine ambient atmosphere for 1000 hours for 1000 hours, it was satisfactory, but when continuous duty was carried out at the temperature of 800 degrees C for 1000 hours, degradation of one piece and a heater was seen among ten pieces.
[0074] Even if it carried out continuous duty of the gas shower object among the fluorine ambient atmosphere for 1000 hours at which [700 degrees C, 750 degrees C, and 800 degrees C] temperature, it was satisfactory at examples 6-10, and 12-17.
[0075] (Example 18) 2 mass % addition of 5 mass % and aluminum 2O3 was done for Y2O3 as sintering acid at nitriding cay prime powder, polyvinyl alcohol was added as a binder and distributed mixing was carried out with the ball mill by using ethanol as a solvent. After carrying out spray dry desiccation of this mixed powder, press forming was carried out so that it might become the diameter of 380mm, and a configuration with a thickness of 1mm. After degreasing this Plastic solid in nitrogen gas with a temperature of 800 degrees C, it sintered at the temperature of 1550 degrees C for 4 hours. The vertical side of the obtained silicon nitride sintered compact was ground with the diamond abrasive grain.
[0076] The tungsten heating circuit pattern was formed in the silicon nitride sintered compact of one sheet by the same approach as an example 1, the SiO2-aluminum2O3 system oxide-ceramics layer whose coefficient of thermal expansion is 5.0x10-6/degree C was formed and laid on top of the silicon nitride sintered compact of one more sheet, and heating junction was carried out at the temperature of 1100 degrees C among nitrogen gas.
[0077] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 750 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer, it was **2.0 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 100 hours, in the front face or through tube 11 of the gas shower object 1, film formation was not performed and adhesion of the film was not generated, either. There was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 20 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 15 minutes from a room temperature to 600 degrees C.
[0078] (Example 19) 2 mass % addition of MgO was done as sintering acid at acid alumimium nitride (AlON) powder, the binder was added and distributed mixing was carried out. After carrying out spray dry desiccation of this mixed powder, press forming was carried out so that it might become the diameter of 380mm, and a configuration with a thickness of 1mm. After degreasing this Plastic solid in a nitrogen air current with a temperature of 800 degrees C, it sintered at the temperature of 1770 degrees C for 4 hours. The vertical side of the obtained acid alumimium nitride sintered compact was ground with the diamond abrasive grain.
[0079] The tungsten heating circuit pattern was formed in the acid alumimium nitride sintered compact of one sheet by the same approach as an example 1, the SiO2-aluminum2O3 system oxide-ceramics layer whose coefficient of thermal expansion is 5.0x10-6/degree C was formed and laid on top of the acid alumimium nitride sintered compact of one more sheet, and heating junction was carried out at the temperature of 1100 degrees C among nitrogen gas.

[0080] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 750 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer, it was **3.0 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 100 hours, in the front face or through tube 11 of the gas shower object 1, film formation was not performed and adhesion of the film was not generated, either. There was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 20 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 15 minutes from a room temperature to 600 degrees C.

[0081] (Example 20) One alumimium nitride sintered compact base material was manufactured using the same manufacture approach as an example 1. The through tube was formed in the alumimium nitride sintered compact base material like the example 1, and the conductive layer of a tungsten was formed. The paste which added the glass of the Yb-Nd-calcium-O system of 3 mass % was printed to alumimium nitride powder, and it was able to be burned on it at the temperature of 1650 degrees C so that the front face of this conductive layer might be covered.

[0082] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **0.4 degrees C. Moreover, although processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 150 hours, in the front face or through tube 11 of the gas shower object 1, film formation was not performed and adhesion of the film was not generated, either. There was also no generating of particle with a particle size of 0.05 micrometers or more on the front face of a silicon wafer 3. After reaction termination, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 7 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 5 minutes from a room temperature to 600 degrees C.

[0083] (Example 21) Five alumimium nitride sintered compact base materials were manufactured by the same manufacture approach as an example 1. Formed the conductive layer of a tungsten by the same approach as an example 1 on the alumimium nitride sintered compact base material of one sheet, the glass layer was made to intervene between the sintered compacts of five sheets, and it joined by the same approach as an example 1. Thus, the gas shower object of the same specification as an example 1 was manufactured.

[0084] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the

front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **0.6 degrees C. Moreover, when processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 30 hours, lock out of a through tube was seen in the through tube 11 of the gas shower object 1. On the front face of a silicon wafer 3, particle occurred and cleaning of the gas shower object 1 is needed. Then, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 reached in 17 minutes from 600 degrees C to the room temperature. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 7 minutes from a room temperature to 600 degrees C.

[0085] (Example 22) Two alumimium nitride sintered compact base materials were manufactured by the same manufacture approach as an example 1. The gas shower object of the same specification as an example 1 was manufactured except [all] having made the number of through tubes into 30 pieces.

[0086] It included in the CVD system as shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. It supplied on the front face of a silicon wafer 3 by making a through tube 11 pass reactant gas, where it impressed 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **7.0 degrees C. Moreover, although processing which forms the titanium nitride film (TiN film) on the front face of a silicon wafer 3 was performed for 100 hours, lock out of a through tube etc. was not seen.

[0087] Then, when the power source supplied to the heating circuit pattern 12 was stopped, it took 10 minutes until the temperature of the gas shower object 1 became a room temperature from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 reached in 6 minutes from a room temperature to 600 degrees C.

[0088] (Example 23) Two alumimium nitride sintered compact base materials were produced by the same manufacture approach as an example 1. The gas shower object was produced by the completely same technique as an example 1 except having formed the conductive layer by applying a molybdenum (Mo) paste to the alumimium nitride sintered compact base material of one sheet.

[0089] When the temperature distribution in the front face of a silicon wafer were measured by the same technique as an example 1, it was **0.4 degrees C. Moreover, the through tube was not blockaded although processing which forms the film like an example 1 was performed for 100 hours. The temperature fall time amount to the room temperature after the heating up time from the room temperature of a gas shower object to 600 degrees C stopped supply of a power source for 6 minutes required 10 minutes.

[0090] (Example 24) Two alumimium nitride sintered compact base materials were produced by the same manufacture approach as an example 1. The gas shower object was produced by the completely same technique as an example 1 except having formed the conductive layer by applying a silver-palladium (Ag-Pd) paste to the alumimium nitride sintered compact base material of one sheet.

[0091] When the temperature distribution in the front face of a silicon wafer were measured by the same technique as an example 1, it was **0.4 degrees C. Moreover, the through tube was not blockaded although processing which forms the film like an example 1 was performed for 100 hours. The temperature fall time amount to the room temperature after the heating up time from the room temperature of a gas shower object to 600 degrees C stopped supply of a power source for 6 minutes required 10 minutes.

[0092] (Example 25) Two alumimium nitride sintered compact base materials were produced by the same manufacture approach as an example 1. The gas shower object was produced by the completely same technique as an example 1 except having formed the conductive layer by applying a nickel-

chromium (nickel-Cr) paste to the alumimium nitride sintered compact base material of one sheet.
[0093] When the temperature distribution in the front face of a silicon wafer were measured by the same technique as an example 1, it was **0.4 degrees C. Moreover, the through tube was not blockaded although processing which forms the film like an example 1 was performed for 100 hours. The temperature fall time amount to the room temperature after the heating up time from the room temperature of a gas shower object to 600 degrees C stopped supply of a power source for 6 minutes required 10 minutes.
[0094] By the same manufacture approach as an example 1, one alumimium nitride sintered compact base material which formed one sheet and a tungsten conductive layer for the alumimium nitride sintered compact base material is produced. (Examples 26-30) The coefficient of thermal expansion joined the sintered compact of two sheets at the temperature of 700 degrees C in nitrogen gas, using respectively the glass which is 2.5x10-6/degree C, 3x10-6/degree C, 5x10-6/degree C, 7.9x10-6/degree C, and 10x10-6/degree C. Although the targets of a programming rate were 30 minutes / less than 600 degrees C, it was divided in 35 minutes, respectively, was divided in 6 minutes, and was not divided in 6 or less minutes, but was divided in 8 minutes, and was divided in 80 minutes.
[0095] (Example 1 of a comparison) Two alumimium nitride sintered compact base materials which have a through tube by the same manufacture approach as an example 1 were manufactured. Printing spreading of the glass powder was carried out on one front face of an alumimium nitride sintered compact base material of one sheet. After degreasing one front face of this alumimium nitride sintered compact base material at the temperature of 500 degrees C, on it, the alumimium nitride sintered compact base material of one more sheet was piled up, it fixed with the fixture made from molybdenum, the weight was carried, and it joined in nitrogen gas with a temperature of 650 degrees C. Thus, the gas shower object 1 as shown in drawing 11 was manufactured. As shown in drawing 11 , the alumimium nitride sintered compact base materials 10a and 10b are joined by the glass layer 13. Two or more through tubes 11 are formed in the gas shower object 1.
[0096] It included in the CVD system as shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the front face of the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 of the gas shower object 1 was made to pass reactant gas, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **15 degrees C. Moreover, when processing which forms the titanium nitride film on the front face of a silicon wafer 3 was performed for 100 hours, neither adhesion of the film nor lock out of a through tube was looked at by the front face and through tube 11 of a base material of the gas shower object 1.
[0097] The temperature up also of the gas shower object 1 was gradually carried out with the radiant heat from the lower wafer supporter 2, and 180 minutes was taken to amount to 600 degrees C. When the electric power supply to the wafer supporter 2 was stopped, the gas shower object 1 reached the room temperature in 15 minutes.
[0098] (Example 2 of a comparison) The alumimium nitride Plastic solid of two sheets was produced by carrying out press forming of the yttria (Y2O3) to alumimium nitride powder with metal mold as sintering acid, so that an outer diameter may be set to 300mm and thickness may be set to 5mm with the dimension after sintering in 5 mass % and a binder, after adding and carrying out distributed mixing. By the condition of having made it arranging spirally [10mm pitch], hotpress sintering of the molybdenum line with a diameter of 0.5mm was carried out at the temperature of 1850 degrees C so that the volume outer diameter of a coil might be set to 5mm between the alumimium nitride Plastic solids of two sheets. It formed one through tube with a diameter of 0.5mm at a time in the alumimium nitride sintered compact base material with the micro diamond drill so that the field to which the heater coil has been arranged after sintering might not be contacted. Thus, 50 through tubes were formed in the alumimium nitride sintered compact base material. The gas shower object 1 which contained the heater coil line 16 in the alumimium nitride sintered compact base material 10 as shown in drawing 12 was acquired.
[0099] It included in the CVD system as shows this gas shower object 1 to drawing 1 . The silicon wafer

3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. It supplied on the front face of a silicon wafer 3 by making a through tube 11 pass reactant gas, where it impressed 200V to the heater coil line 16 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **10 degrees C. Moreover, when processing which forms the titanium nitride film in the front face of a silicon wafer 3 was performed for 8 hours, the film adhered to the front face and through tube of a base material of the gas shower object 1, and lock out of a through tube was seen. Also on the front face of a silicon wafer 3, particle occurred and cleaning of the gas shower object 1 is needed. Then, when the power source supplied to the heater coil line 16 was stopped, it took 180 minutes until the temperature of the gas shower object 1 became a room temperature from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heater coil line 16 and the power source was supplied, the temperature of the gas shower object 1 took 30 minutes until it became 600 degrees C from the room temperature.

[0100] (Example 3 of a comparison) Six alumimium nitride sintered compact base materials in which the through tube was formed by the same manufacture approach as an example 1 were manufactured. Formed the conductive layer of a tungsten by the same approach as an example 1 on the alumimium nitride sintered compact base material of one sheet, the glass layer was made to intervene between the sintered compacts of six sheets, and it joined by the same approach as an example 1.

[0101] It included in the interior of the CVD system which shows the acquired gas shower object 1 to drawing 1 . The silicon wafer 3 with a diameter of 300mm was carried on the wafer supporter 2, and it heated in temperature of 700 degrees C. The through tube 11 was made to pass reactant gas, where it impressed the electrical potential difference of 200V to the heating circuit pattern 12 of the gas shower object 1 and the gas shower object 1 is heated at 600 degrees C on the other hand, and it supplied on the front face of a silicon wafer 3. When the temperature distribution in the front face of a silicon wafer 3 were measured with the radiation surface thermometer in this condition, it was **0.8 degrees C. Moreover, when processing which forms the titanium nitride (TiN) film on the front face of a silicon wafer 3 using predetermined reactant gas was performed for 14 hours, the film adhered to the front face and through tube of the gas shower object 1, and lock out of a through tube was seen. On the front face of a silicon wafer 3, particle occurred and cleaning of the gas shower object 1 is needed. Then, when supply of the power source to the heating circuit pattern 12 of the gas shower object 1 was stopped, the temperature of the gas shower object 1 took 30 minutes until it became a room temperature from 600 degrees C. Moreover, when the electrical potential difference of 200V was impressed to the heating circuit pattern 12 and the power source was supplied, the temperature of the gas shower object 1 took 15 minutes until it became 600 degrees C from the room temperature.

[0102] The structure of the gas shower object in the above examples 1-30 and examples 1-3 of a comparison and a result are shown in Table 1. In addition, in Table 1, "W POSUMETA" means that the conductive layer containing a tungsten is formed by the postmetallizing method, "W KOFA year" shows that the conductive layer containing a tungsten is formed by the KOFA year method, and it is shown that "Mo coil / HP" manufactures a sintered compact base material by hotpress sintering in the condition of having made the molybdenum coil line intervening.

[0103]

[Table 1]

		構造					結果
		導電層	貫通孔密度 個/cm^2	装置	基材厚み mm	接着層または保護層熱膨張係数 ($\times 10^{-6}$/℃)	ウェハ温度分布 ±℃
実施例	1	Wﾎﾟｽﾒﾀ	0.7	CVD	2	5	0.4
	2	Wﾎﾟｽﾒﾀ	0.14	CVD	2	5	4.0
	3	Wﾎﾟｽﾒﾀ	0.7	ﾌﾟﾗｽﾞﾏ CVD	3	5	0.5
	4	Wｺﾌｧｲﾔｰ	0.7	CVD	2	5	0.5
	5~17	Wﾎﾟｽﾒﾀ	0.7	CVD	2	非酸化物3~6	0.5
	18	Wﾎﾟｽﾒﾀ	0.7	CVD	Si_3N_4:2	5	2.0
	19	Wﾎﾟｽﾒﾀ	0.7	CVD	AlON:2	5	3.0
	20	Wﾎﾟｽﾒﾀ	0.7	CVD	1	AlN:4.5	0.4
	21	Wﾎﾟｽﾒﾀ	0.7	CVD	5	5	0.6
	22	Wﾎﾟｽﾒﾀ	0.05	CVD	2	5	7.0
	23	Mo	0.7	CVD	2	5	0.4
	24	Ag-Pd	0.7	CVD	2	5	0.4
	25	Ni-Cr	0.7	CVD	2	5	0.4
	26	Wﾎﾟｽﾒﾀ	0.7	CVD	2	2.5	-
	27	Wﾎﾟｽﾒﾀ	0.7	CVD	2	3	-
	28	Wﾎﾟｽﾒﾀ	0.7	CVD	2	5	-
	29	Wﾎﾟｽﾒﾀ	0.7	CVD	2	7.9	-
	30	Wﾎﾟｽﾒﾀ	0.7	CVD	2	10	-
比較例	1	ﾋｰﾀｰなし	0.7	CVD	2	5	15.0
	2	Mo ｺｲﾙ/HP	0.07	CVD	10	-	10.0
	3	Wﾎﾟｽﾒﾀ	0.7	CVD	6	5	0.8

[0104]
[Table 2]

実施例	接着層	接合温度
5	40%AlN+60%(Ca-Al-Si-O)	1600℃
6	50%AlN+50%(Ca-Al-Si-O)	1600℃
7	70%AlN+30%(Ca-Al-Si-O)	1600℃
8	90%AlN+10%(Y-Ca-O)	1650℃
9	90%AlN+10%(Yb-Nd-Ca-O)	1650℃
10	90%AlN+10%(Yb-Nd-Ca-O)	1650℃
11	97%AlN+3%(Yb-Nd-Ca-O)	1650℃
12	40%Si_3N_4+60%(Ca-Al-Si-O)	1600℃
13	50%Si_3N_4+50%(Ca-Al-Si-O)	1600℃
14	70%Si_3N_4+30%(Y-Al-Mg-O)	1600℃
15	90%Si_3N_4+10%(Y-Al-Mg-O)	1650℃
16	90%AlN+10%(Y-Al-Mg-O)	1650℃
17	Yb-Nd-Ca-O	1650℃

[0105] It should be considered that the gestalt and example of operation which were indicated above are shown by no points in instantiation, and are not restrictive. The range of this invention is not the gestalt or example of the above operation, is shown by the claim and includes all corrections and modification in a claim, equal semantics, and within the limits.

[0106]
[Effect of the Invention] According to this invention, when the outer diameter of the semi-conductor wafer as a processing object increases, the structure equipped with the heater function and the structure having the function of a heater and a plasma electrode can be offered as a gas shower object used for semiconductor fabrication machines and equipment, such as a CVD system to be heated more uniform, plasma-CVD equipment, and an elevated-temperature etching system. By using the gas shower object which has such structure, homogeneity heating of reactant gas can be realized and it becomes possible to form the film on the front face of a semi-conductor wafer at homogeneity, or to perform uniform etching. Moreover, since unnecessary film formation stops arising on the front face of the base material of a gas shower object, the concentration of the gas in the chamber by lock out of a through tube and aging of a flow rate can be prevented. Furthermore, it becomes possible to also control generating of the particle which the film adhering to the front face of the base material of a gas shower object exfoliates and generates.

[Translation done.]